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PREFACE.

THE present Part completes the Fifty-second Volume of the Society's *Transactions*, and contains the details of the subjects approved and rewarded during the last Session. It has been the constant practice to prefix to each volume an analysis of its contents, in order to point out the principal matters of novelty and importance that are to be found in its pages, to such of our members as feel an interest in the welfare of the Society, but are unable, from non-residence or other causes, to share personally in its proceedings. A further object which the Committee of Publication have in view in this summary, is to justify the claims which the Society prefers to the support of the Public, by bringing before their notice, from time to time, a statement, free from technical details, of the several improvements and inventions collected by the Society and freely offered as their contribution to the general stock of practical knowledge.

In the class of Agriculture will be found three papers, all worthy of notice. One, by Col. Le Couteur, is on hoeing wheat. This plant, as is

well known, has two kinds of roots; namely, the seminal, which are first produced, and descend to a considerable depth in the soil, and the coronal, which shoot out afterwards around the crown of the plant immediately previous to its tillering. Col. Le Couteur seems to have ascertained that wheat sown in drills seven or nine inches apart, and covered to the depth of about three inches, is in the most favourable circumstances for the due developement of these two sets of roots; whereas, in wheat sown broadcast, those grains that are only just covered with soil exhibit the two kinds of roots mixed and crowded together. In wheat sown about Christmas or in January, the coronal roots begin to appear about eighty days after the germination of the seed. This, therefore, is the proper time to give the principal hoeing, as at this time the weeds may be cut up without any risk of interfering with the coronal roots; and, by stirring and loosening the ground, so much encouragement is given to the growth of them, that they soon extend quite across the drills, occupying the ground to the almost exclusion of the deeper-rooted weeds, and throwing out a luxuriant growth of side shoots, the forerunners and causes of an abundant crop.

Mr. G. Aikin has furnished an interesting paper, describing the recent improvements in the agricultural management of the Fen districts of

Cambridge and the adjacent counties. These improvements are founded on the discovery of beds of calcareous marl lying almost every where below the peaty and silty surface of the fen. A very simple and economical method of raising the marl, and distributing it over the surface, has been found out; the result of which (combined with the perfect system of drainage by the use of the steam-engine) has been, that lands which, in the usual course, produced only two grain crops, both of them oats, now yield one crop of oats and two of wheat.

Three years ago, Mr. Buchanan sent to the Society a paper describing his method of raising seedling potatoes, accompanied by samples of some varieties of this valuable root thus obtained. The samples were small tubers, being the produce of only the second year from the seed. In this early stage the qualities and probable value of the varieties could not be ascertained; the Society, therefore, placed them in the hands of two of their members to grow them, and to report the result. This was accordingly done; and, as it appeared desirable to continue the experiment a year longer, the same gentlemen who had made the first, offered to make a second experiment, the results of the latter of which will be laid before the public in the next volume.

In the class of Fine Art may be noticed Mr.

Wildman's ingenious method of obtaining casts from soft anatomical specimens, either recent or prepared; the perfect success of which can only be duly estimated after inspecting the specimens deposited in the Society's Museum; it being impossible to describe in words the beautiful and minute accuracy with which all the different varieties of structure have been impressed on the plaster.

Mr. Esquilant's adaptation of prepared leather, as a material for representing flowers, foliage, and fruit, in the highest relief, deserves to be particularly noticed. Its toughness and little liability to injury, either from changes of weather or accidental blows, render it peculiarly well adapted for cornices, for wreaths on panels, and other situations fitted for architectural decoration; and its moderate cost, when compared with that of actual carving, is a farther recommendation to its use.

Mr. Redman's method of making transfers from copperplate prints to the surface of zinc or stone, contains improvements sanctioned by the testimony of professional artists in this line, and confirmed by the very satisfactory specimens in the Society's possession.

Mr. Billings' analysis of the architectural construction of the great east window of Carlisle Cathedral, is alike creditable to his industry and skill; while the care with which he has made out

the jointing of the several parts will be found of great practical value to those who are engaged in the construction or reparation of similar objects.

In the class of Chemistry, Mr. Thompson has contributed a very valuable paper, shewing how Prussian-blue can be made without the necessity of employing horn or other animal matter as one of the ingredients. To the same gentleman the Society is indebted for a method of obtaining pure copper from bell-metal, gun-metal, and other alloys of copper with any metal having a stronger attraction for oxygen than copper itself has. It consists in mixing the impure copper with such a proportion of copper scales, or any other oxide of copper, as may be indicated by a previous assay, and then melting the whole with green glass or any other convenient flux. The oxygen of the added oxide of copper is thus transferred to the more oxidable metal with which the copper is alloyed, and the new compound is taken up and dissolved in the flux.

Messrs. Bursill have communicated their safe-lamp for miners, which, being supplied with a constant stream of pure atmospheric air from a reservoir into which it has been previously forced by strong compression, avoids the usual risks attending the employment of air taken from that which circulates in the mine.

Mr. Cooper's paper on the recently invented

art of photographic drawing, has the practical value derived from minuteness in detail and clearness in description of a process which, if it differs but little from that already known, has, at least, the advantage of certainty and permanence in its result. The permanence of Mr. Cooper's delineations is inferred from one of his specimens having been exposed for several weeks, since it came into the Society's possession, to the full action of air and light, without any sensible diminution of its original clearness.

Mr. Marsh has found, in the colouring ingredient of the red varieties of the common dahlia, a material easily extracted by hot water, and equally applicable as a test for acids and alkalies with the other vegetable infusions that are generally used for this purpose. A minute proportion of corrosive sublimate prevents the dahlia liquor from losing its colour by keeping, but Mr. Marsh's attempts to use it as a permanent dye have not hitherto been successful.

In the class of Colonies and Trade will be found the reports of three Committees on the tea of Assam, on the different kinds of wild silk from that country, and on two samples of common silk grown in Bengal, to which the Agricultural and Horticultural Society of India had awarded its first and second medals. The sample of tea was sent to the Society by the Chairman of the Court

of Directors of the East India Company, and seems likely, under proper management, to replace certain of the lower priced teas of China. To the cultivation and amelioration of this indigenous, but hitherto unnoticed, product of our Indian empire, the present critical state of our commercial intercourse with China will, doubtless, prove a great encouragement.

The report on the wild or Jungle silk of Assam is founded on samples of the different kinds in their raw and manufactured state, collected by Capt. Jenkins, the British resident in that country, and transmitted by the Agricultural and Horticultural Society of India. The report points out the peculiar characters of each kind of silk, the property of great durability which they possess in common, recapitulates experiments made to improve their lustre and colour, and states the increasing demand which has sprung up within the last four or five years for these silks, in consequence of their use in covering parasols; for which, in their natural colour, they seem very well adapted.

The two samples of Bengal prize-silk were transmitted by the Agricultural and Horticultural Society of India, with a request that the Society of Arts would examine them, and obtain the opinions of brokers and manufacturers to confirm or correct the judgment formed of them in India.

The Society, with their usual readiness to investigate any matter affecting the prosperity of so important a dependency of the British nation, have obtained the opinions of brokers and others on the raw silk, and have had it submitted to the usual preliminary processes of manufacture, in order that the estimate of it in its raw state may be confirmed or modified by that of the manufacturer. The result on the whole is very satisfactory, and, no doubt, will accelerate the improvement of Bengal silk ; and thus bring it in nearer and nearer competition with the higher kinds of Italian silk.

In the class of Manufactures will be found three articles all relating to the manufacture of silk, and all from the ingenious artists of Spital-fields.

Mr. Farley's improvement is in the broad silk-loom, adapted to weaving satins, serges, and small figures, such as do not require the more complex mechanism of the jacquard machine. In this loom eight, and sometimes a greater number of treadles are required, and the order in which they are to be depressed by the weaver varies for every different pattern or kind of work on which he is employed. This is some tax on his memory, and a constant one on his attention. When a mistake occurs, which will sometimes happen with the most steady workman, the motions must be reversed ; and considerable time is lost in rectifying the

error. It is also impossible so to arrange a number of treadles as that some shall not be placed at such a distance as to be inconvenient and fatiguing to the weaver. In Mr. Farley's machine, the shafts that are usually worked by the treadles are moved by a single paddle, and this paddle by one treadle; the order in which the shafts are to be lifted being regulated by a cylinder furnished with movable cams. When, therefore, these cams have been placed in such positions as to raise the shafts in any required order, the weaver has only to work the one treadle. Error is impossible; much fatigue on the part of the workman is saved, as well as the wearying attention necessary on the common plan, in order to avoid mistakes.

In Mr. Dove's machine for weaving the figured silk, technically called silk tissue, he has contrived to stop the motion of the prism carrying the pattern-cards, while the smaller prism is producing the plain work introduced between the parts of the pattern or between its repetition; and thus he is enabled to save the whole of the blank-cards of the pattern, which were necessary as long as the motion of the pattern-prism was contemporaneous with that of the smaller prism.

Messrs. Hanchard, Sodo, and Cole have each contributed their parts to enable the English to vie with the French weaver in making wide velvet. The difficulty in weaving velvet wider than ordi-

nary consists in the introduction of the cutting-wires, which, being very slender, cannot be inserted into a wide warp without frequent derangement of the threads, and consequent loss of time or imperfection in the work. But if the wires are put into a tube with a blunt point, this, being large and little flexible, may be safely and expeditiously placed between the warp-threads, and may afterwards be withdrawn, leaving the cutting wire in its proper place. Thus velvet may be made more than twice as wide as ordinary; and no more time will be required in making a given quantity of surface of one than of the other.

In the class of Mechanics, the first place, on account of their scientific character, is due to Mr. Goddard's paper on the Polarisation of Light, and Mr. Ross's on Achromatic Telescopes; the first part of the former of these describes the properties of polarised light, illustrated by diagrams, and is followed by an account of an improved apparatus, adapted to the lecture-room, in which the beautiful phenomena of polarisation are shewn by means of the oxyhydrogen lamp.

Mr. Ross's paper on the construction of achromatic telescopes, is the substance of two illustrations formerly read by him before the Society. It begins by explaining the nature and causes of spherical aberration and of chromatism, or the coloured refraction of light; shews in what way

these affect the distinctness of vision in telescopes, and how they are to be corrected; and concludes by giving the formulæ, together with the modifications necessary to be adopted in practice, for ascertaining the curvature of the lenses and their focal distances, so as to enable the artist to construct aplanatic telescopes, as good as can be obtained in the present imperfect state of the glass which we are obliged to employ.

In clock and watch-making, Mr. Paine's Escapement-Wheel for Turret-Clocks deserves notice on account of its novelty. The frame-work is of gun-metal, and the teeth are of tempered steel: each tooth may be put in, taken out, and adjusted independently of the others; and it appears that the clock of one of the churches of Sheffield, having three 7-feet dials, is furnished with an escapement-wheel of this kind, which was put up in the year 1830, and has ever since acted entirely to the satisfaction of the person entrusted with the care of it.

To the architect and builder may be recommended Mr. Jeay's Method of Determining the Length and Bevels of Timbers in a Hip-roof, invented by a professional man, and the utility of which has been ascertained in practice. Mr. Holmes's Spring Bolt-plate for Folding-doors connecting two rooms, has been introduced at Chatsworth by the inventor, who is clerk of the works

now going on at that ducal mansion, and has been adopted by several builders in London.

Mr. Wivell's Fire-escape, and Mr. Baddeley's Portable Tank for Use at Fires, are recommended to the favourable notice of the public. Of the former several have been made, and have been purchased by parishes and other public bodies, as being, on the whole, the best of this class of machines, combining, in no ordinary degree simplicity of construction, easy and rapid portability, and facility in working. The so-called portable tank may be described more properly as a rectangular funnel about eighteen inches high, which folds up into a small space, furnished with a short pipe which fits any plug-hole connected with the water-mains. The water rushes up and fills the funnel, as soon as it has been applied to the plug-hole; and thus the suction-pipes of the fire-engines that are laid in it are furnished with a copious supply of clean water, unmixed with the mud and small gravel that are usually drawn up from dams made in the street, to the injury of the valves of the machine. The obvious utility of the contrivance has occasioned it to be attached to several of the London fire-engines.

Of subjects connected with nautical affairs may be particularised Mr. Edye's Improved Pendulum for ascertaining the stability of a ship; also some sensible remarks, founded on actual observation, by

Mr. Kennish, carpenter in the navy, on the injury suffered by the sides and other parts of ships that are usually covered by black paint. This arises partly from the porosity of black paint, compared with that of which white-lead or earthy substances are the basis, but, in a great measure, also on the higher temperature which black paint acquires by exposure to sunshine than paint of any other colour does. Captain Cookesley's Raft also deserves particular notice, as an ingenious way of lashing together casks and spars, which may be made available not only in case of shipwreck, but on other occasions.

Mr. J. Gray's Instruments for Extracting Teeth are made on sound mechanical principles; but their comparative worth must finally be determined by the result of actual practice.

Captain Ericsson's Hydrostatic Weighing Machine is a beautiful contrivance, and admits of great accuracy, being free from friction. The weight to be ascertained presses on the surface of a shallow reservoir of mercury, and thus causes the metal to ascend in a fine tube to which a graduated scale is attached. The mercury in the tube re-acts on the compressing weight, according to the law of the pressure of fluids; and thus a column of moderate range will shew great differences of weight.

Four Illustrations — on Artificial Light and
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the Manufacture of Candles ; on the Natural History and Commercial History of Cotton ; on Bone and its Uses in the Arts ; and on Horn and Tortoiseshell, have been obligingly communicated by Mr. Aikin, lately Secretary to the Society.

The original drawings of the wood-engravings by which the present volume is illustrated, have all of them been presented to the Society ; that of the east window of Carlisle Cathedral, by Mr. Billings ; those illustrating Mr. Goddard's paper, by Mr. Goddard ; that of Mr. Ericsson's weighing apparatus, by Mr. Ericsson ; those relating to Mr. Gray's paper, by Mr. Gray ; those belonging to Mr. Ross's paper, by Mr. Ainger ; and the remainder by R. H. Solly, Esq. Mr. Billings likewise has allowed the Society the use of the two copperplates representing the east window of Carlisle Cathedral.

To the liberality of D. Campbell, Esq. the Society are indebted for a very beautiful and accurate model of Mr. Wivell's fire-escape, on a scale sufficiently large to shew all its details in their due proportion.